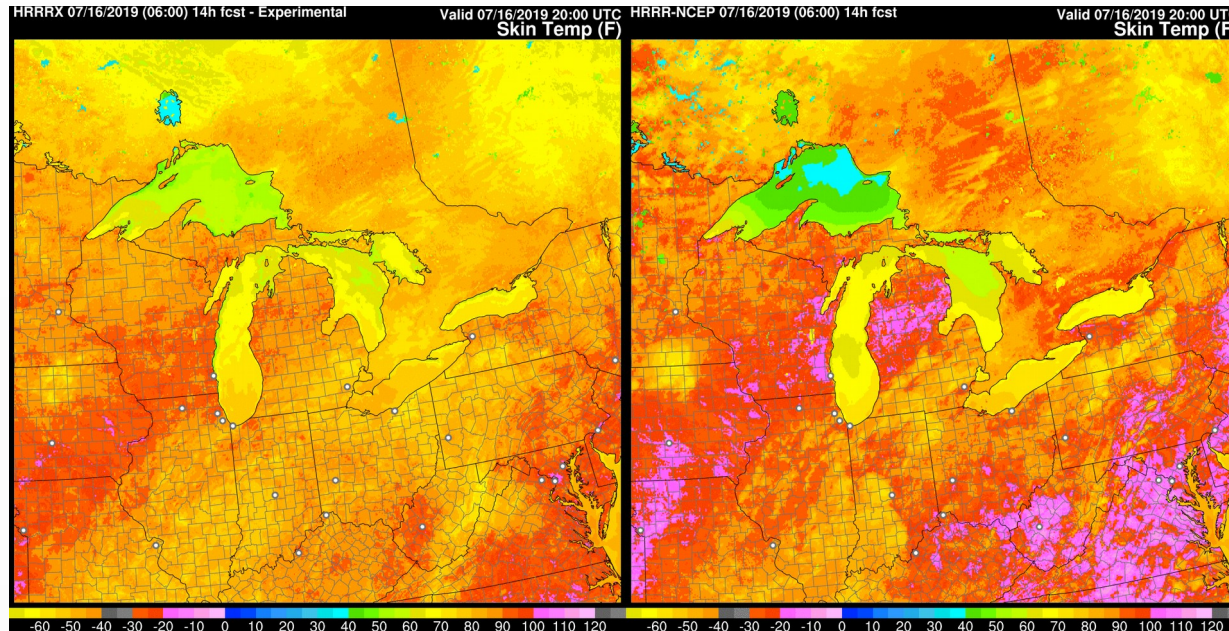


MEG DISCUSSION

The RAPv5/HRRRv4 Evaluation



10 October 2019

Geoff Manikin
Curtis Alexander

NCEP/EMC
ESRL/GSD

geoffrey.manikin@noaa.gov
curtis.alexander@noaa.gov

BIG PICTURE

- RAPv5/HRRRv4 implementation scheduled for Q3FY20
- Code handoff to NCO must occur by the first week of January 2020, so the evaluation must be wrapped up by mid-December
- Building of the parallels was delayed, so to meet the schedule, the evaluation period will be slightly compacted
- EMC cannot run HRRR-CONUS and HRRR-AK parallels simultaneously
- This is the final RAP/HRRR upgrade; we will move to the FV3-based Rapid Refresh Forecast System (RRFS) in 3-4 years

THE PLAN

- The evaluation period will run 15 October to 13 December 2019
- The RAPv5 parallel will be run throughout the evaluation period
- The HRRRv4-Alaska parallel will be run 15 October to 13 November
- The HRRRv4-CONUS parallel will be run 14 November to 13 December
- 3 one-month RAP and HRRR-CONUS retrospective periods will cover summer 2018, winter 2019, and spring 2019 (May – active convective month)
- 2 one-month HRRR-AK retrospective periods will cover summer 2018 and winter 2019
- Evaluations will be due 17 December
- Acting NCEP Director will be briefed around 20 December
- Implementation targeted for June 2020

HOW to EVALUATE

- Grib2 and station time series bufr output available on EMC ftp server (and eventually paranomads) for all real-time parallels
- Real-time Parallel Graphics for RAP (entire period)
- Real-time Parallel Graphics for HRRR-AK (during first month)
- Real-time Parallel Graphics for HRRR-CONUS (second month)
- Graphics for selected HRRR-CONUS retrospective cases (will start to populate web site in next few weeks)
- Graphics for selected HRRR-AK retrospective cases (will populate after real-time HRRR-AK parallel is turned off)
- Statistics from real-time and retrospective parallels (available soon)
- MEG presentations over the next two months

WHAT TO LOOK FOR

- Is there improvement (or, at a minimum, limited degradation) in overall synoptic and mesoscale performance (including boundary layer structure and dryline position)?
- Does the HRRRDAS improve initialization and maintenance of convection?
- Are there improved vertical velocity (and UH) signals in convection?
- Is the new smoke output useful?
- Is there better representation of temperatures of small lakes?
- Are the temperatures of the Great Lakes handled better?
- Is there improved retention of shallow cloudy air masses?
- Is there improvement in snowfall amounts?
- Are there benefits in extending some RAP forecasts to 51 hours and HRRR forecasts to 48 hours?

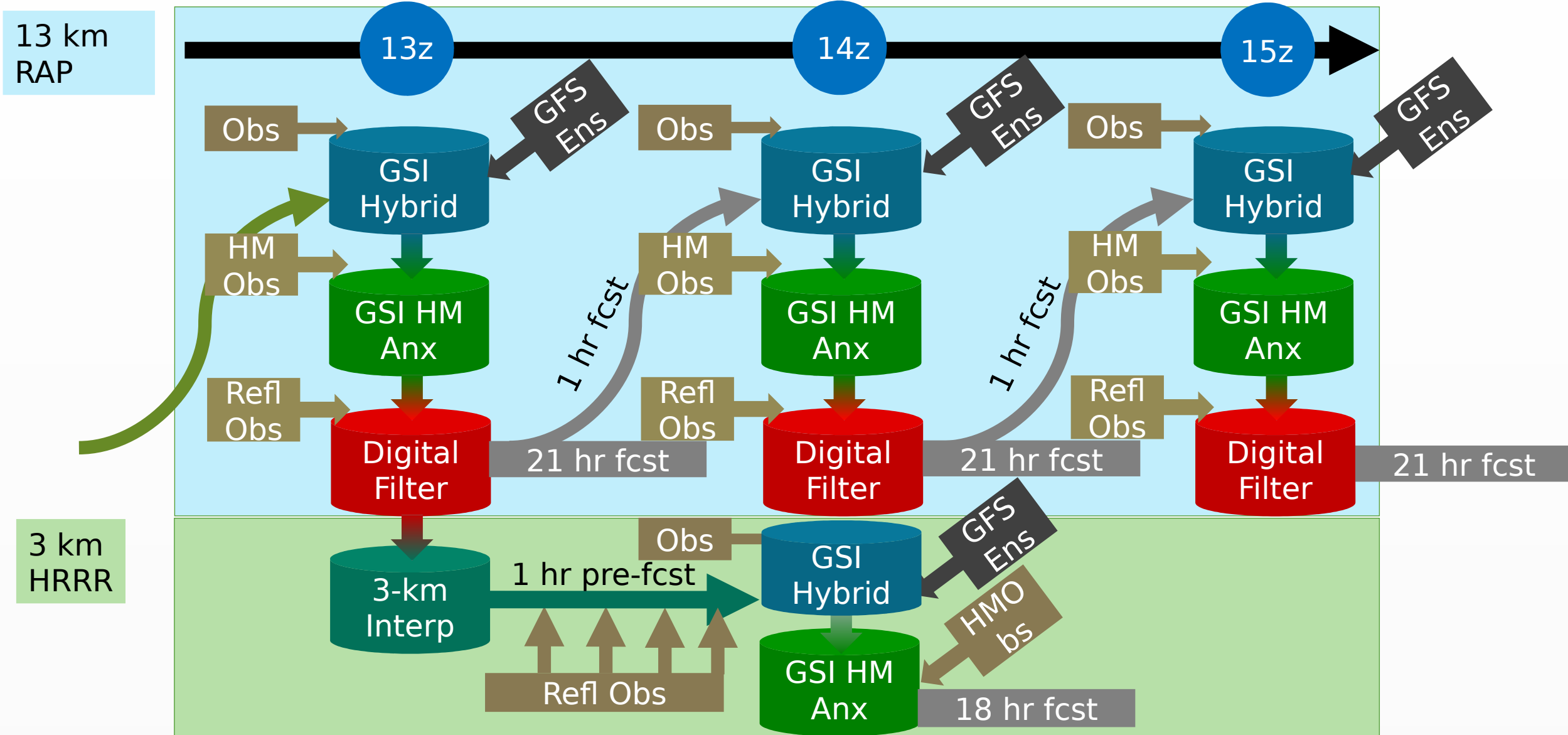
MEG EVALUATION PAGE

https://www.emc.ncep.noaa.gov/users/meg/rapv5_hrrrv4/

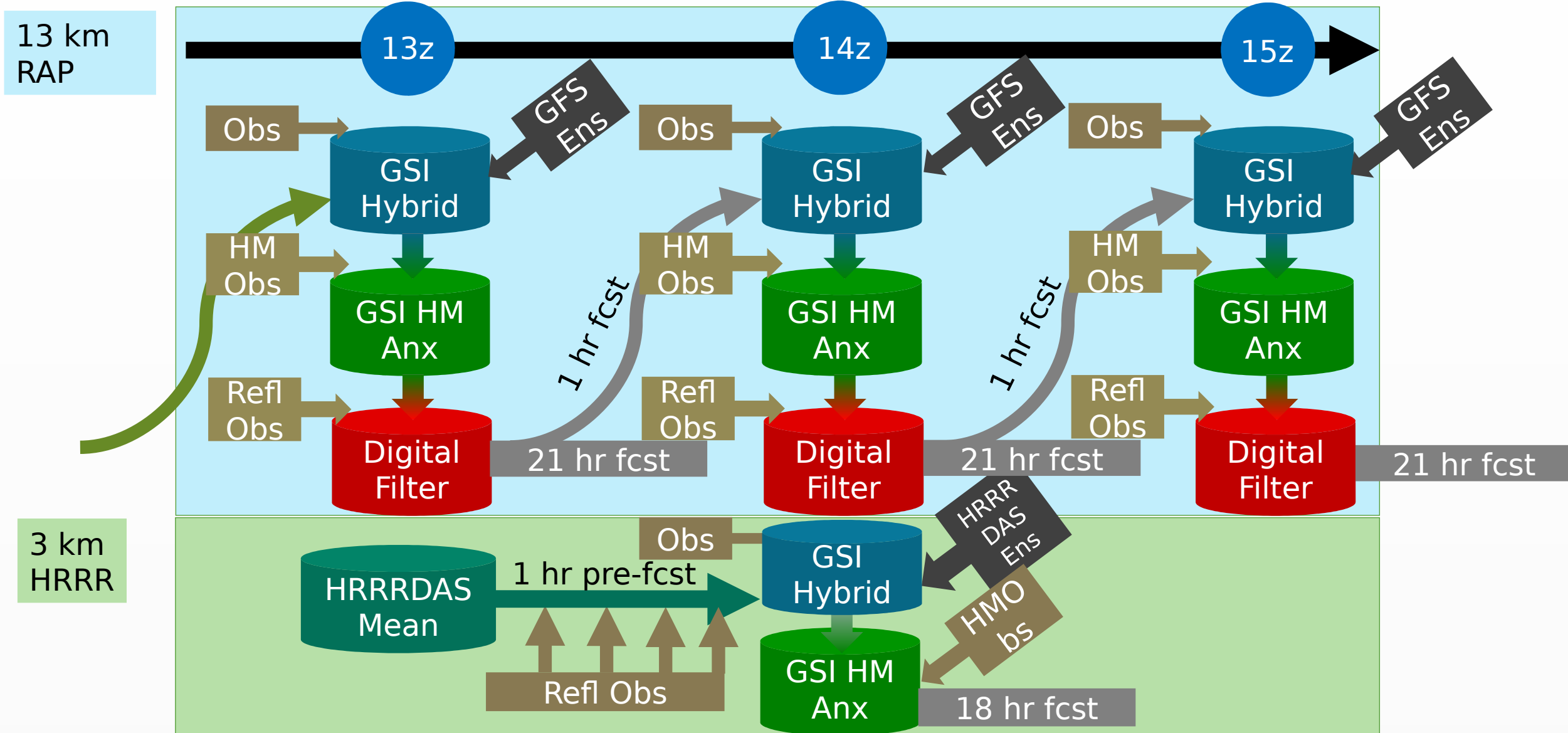
2020 RAPv5/HRRRv4 Changes

Model	Data Assimilation	Land-surface / post
<p>WRF-ARWv3.9+ incl. phys changes</p> <p><u>Physics changes:</u> MYNN PBL update – better sub-grid clouds, improved EDMF mixing - remove limit for subgrid qc/qi - decrease subgrid qc/qi radii</p> <p>RRTMG modifications for subgrid clouds Aerosols sources/sinks – fire/smoke, dust - Add smoke with VIIRS FRP Improved land-surface/snow model including better 2m T/Td diagnostics Latest Grell-Freitas conv (RAP only) Lake model for small lakes Enhanced gravity-wave drag</p> <p><u>Numerics changes:</u> Reduced 6th order diffusion inc. hydrom Removal of mp_tend_lim Explicit-Implicit vertical advection</p>	<p>Merge with GSI trunk – 2019</p> <p><u>New Observations for assimilation:</u> GOES-16 radiances, CrIS/ATMS TC vitals for trop cyclone location/strength Aircraft/raob moisture obs for p<300 hPa VIIRS/MODIS fire radiative power</p> <p><u>Assimilation Methods:</u> HRRR - 3km ensemble DA (36 mems out to 1h) – HRRRDAS mean for HRRR IC and BEC</p> <div> <p>Extend 03/09/15/21z RAP to f51 Extend 00/06/12/18z HRRRs to f48</p> </div>	<p>Switch to MODIS albedo (higher), replace 1-deg albedo.</p> <p>Add zenith-ang albedo adj</p> <p>15” resolution land use data</p> <p>Fractional sea/lake ice concentration</p> <p>FVCOM data for Great Lakes lake temp/ice concentration</p> <p>VIIRS/MODIS/GOES fire radiative power</p> <p>HAILCAST diagnostic</p> <p>Smoke (2.5 pm) products</p>

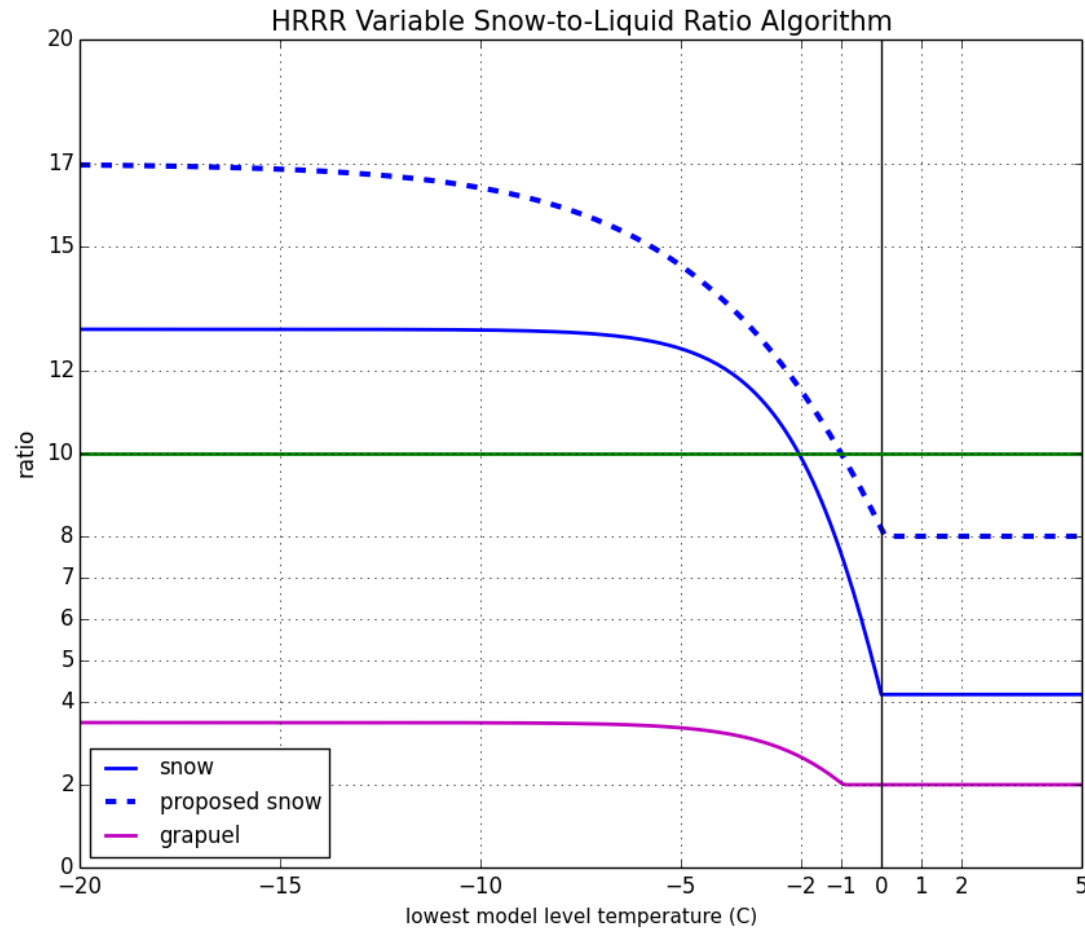
HRRRv3 Initialization from RAPv4



HRRRv4 Initialization



Updated RAPv5/HRRRv4 variable-density snow accumulation SLR=f(T) Algorithm



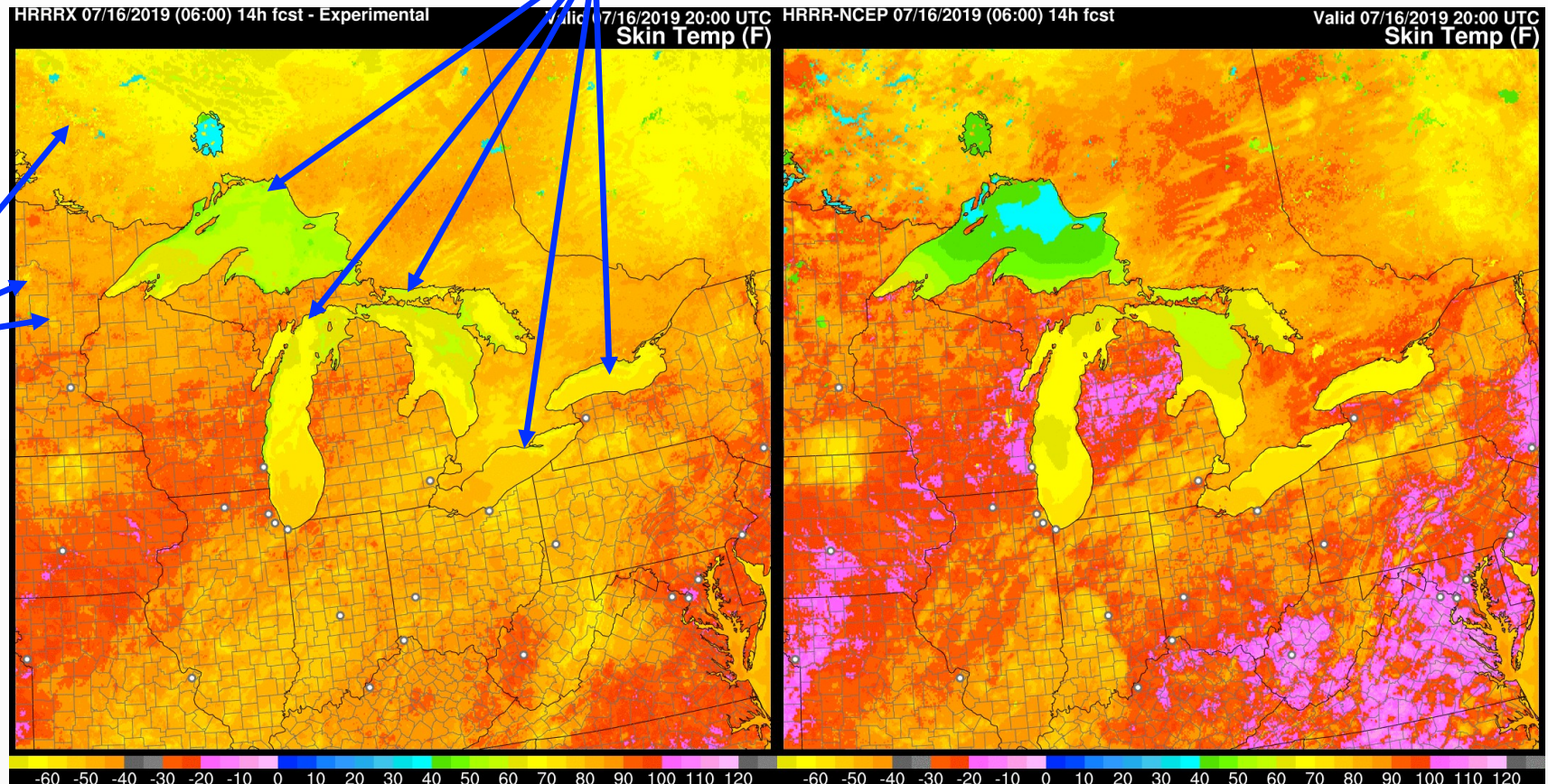
New prototype RAPv5/HRRRv4 -- based on two years of development/testing/evaluation (WPC/WFOs)

Current Operational RAPv4/HRRRv3

FVCOM-based Great Lakes Temps/Ice

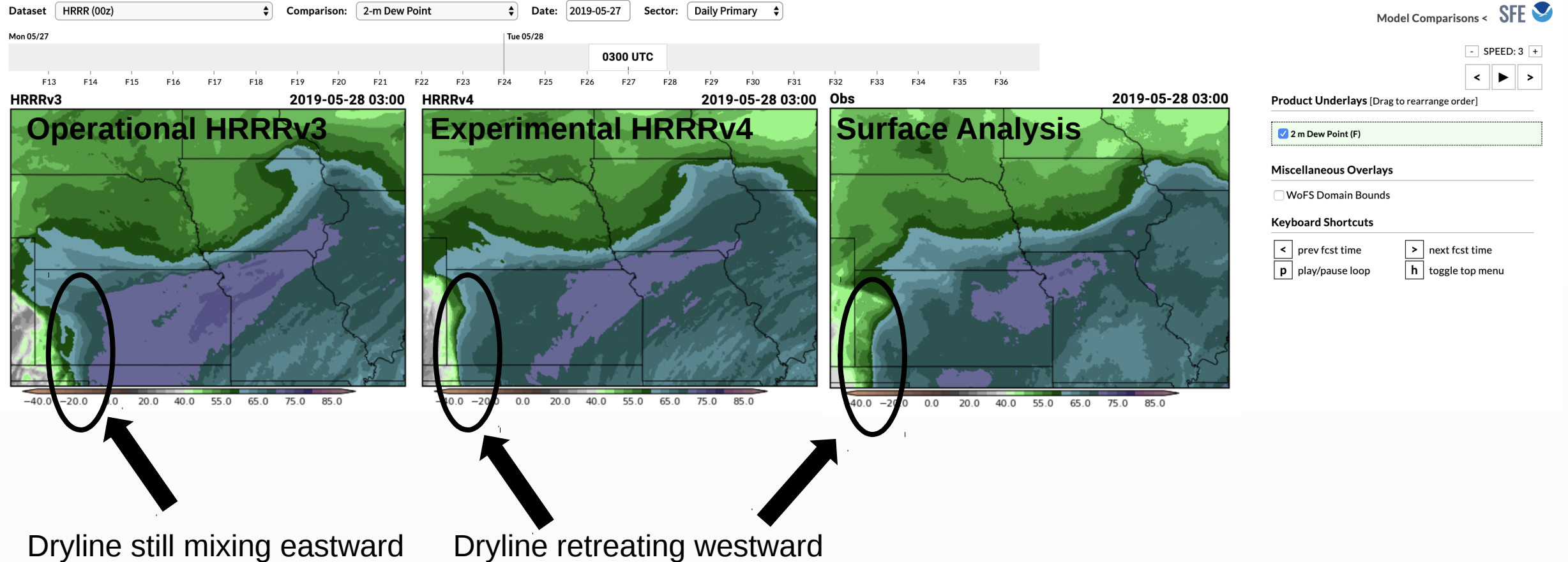
CLM-based Inland Lake Surface Temps

FVCOM lake temperatures (ESRL-GLERL collaboration)



Dryline Position and Evolution

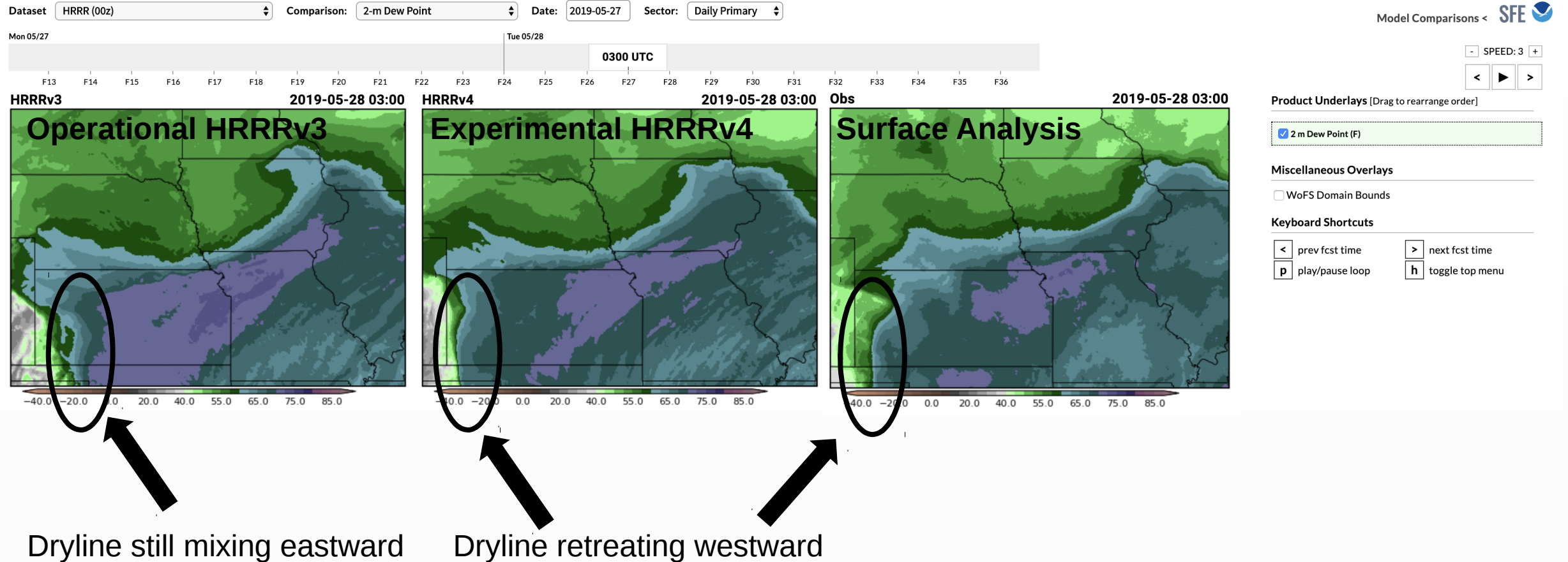
27 hr Forecasts Valid
03 UTC 27 May 2019



Data processed and plotted at NOAA NSSL/NWS SPC • Part of the NOAA Hazardous Weather Testbed

Dryline Position and Evolution

27 hr Forecasts Valid
03 UTC 27 May 2019



Data processed and plotted at NOAA NSSL/NWS SPC • Part of the NOAA Hazardous Weather Testbed

RAPv5:
1-27 Feb 2019

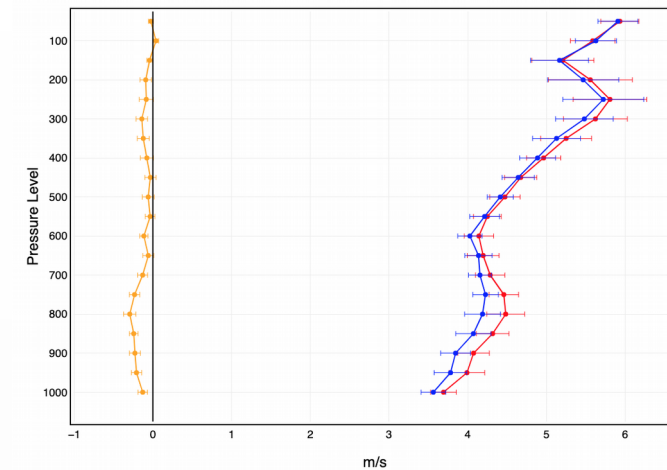
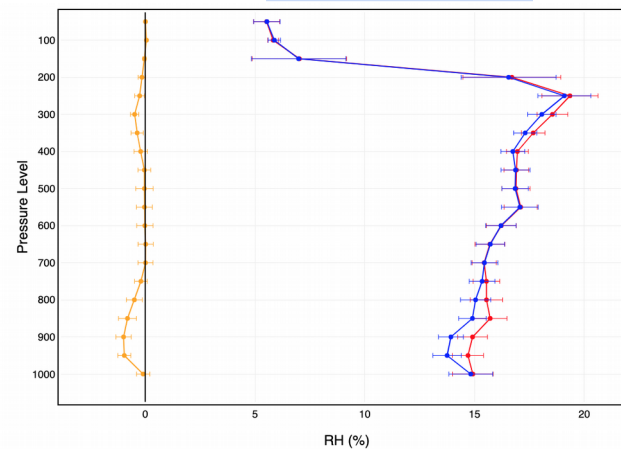
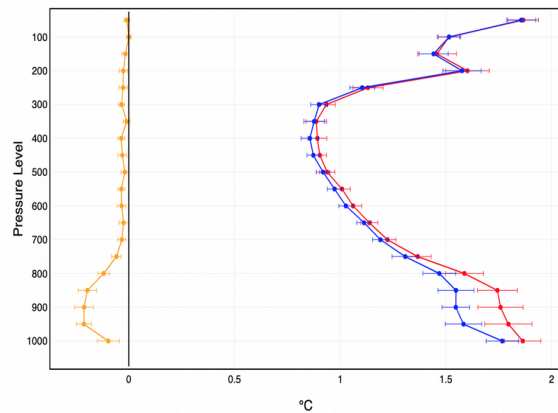
temp

RHobT

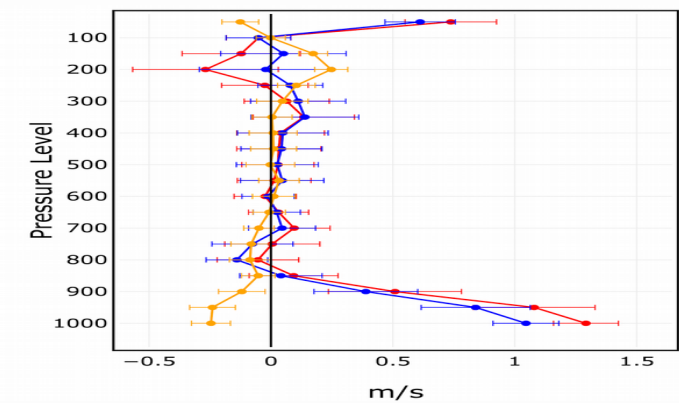
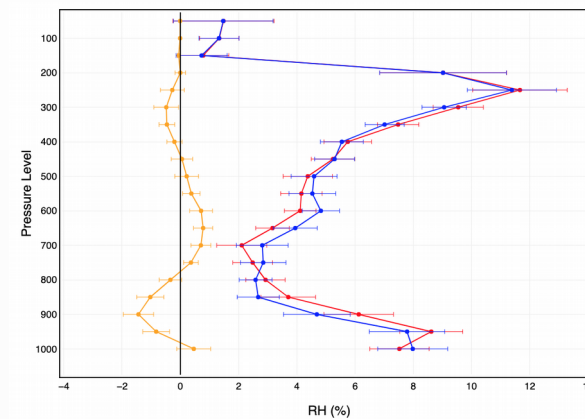
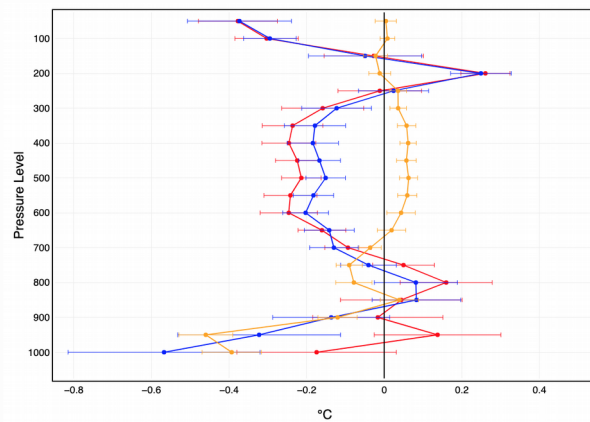
wind

RAP-OPS
RAPv5_RC1

12-h RMSE



12-h bias
00 UTC



12-h bias
12 UTC

